- 1 1. A method of determining a condition of a region of a tissue sample, said method comprising the steps of:
- obtaining a first set of spectral data corresponding to a region of a tissue sample using light incident to said region at a first angle;
- 5 (b) obtaining a second set of spectral data corresponding to said region using 6 light incident to said region at a second angle;
- 7 (c) selecting at least one of said first set of spectral data and said second set of 8 spectral data that is representative of said region of said tissue sample; and
- 9 (d) determining a condition of said region of said tissue sample based at least 10 in part on a subset of said at least one set of spectral data selected in step (c).
- 1 2. The method of claim 1, wherein said first set of spectral data comprises
- 2 reflectance spectral data and said second set of spectral data comprises reflectance
- 3 spectral data.
- The method of claim 1, wherein said at least one of said first set of spectral data and said second set of spectral data comprises fluorescence spectral data.
- 1 4. The method of claim 1, further comprising obtaining a third set of spectral data
- 2 corresponding to said region using light incident to said region at a third angle.
- 1 5. The method of claim 1, further comprising obtaining each of a plurality of sets of
- 2 spectral data in addition to said first set and said second set using light incident to said
- 3 region at a unique angle.
- 1 6. The method of claim 1, wherein said condition is a state of health.

- The method of claim 6, wherein said state of health comprises at least one of the
- 2 conditions of normal squamous tissue, metaplasia, CIN I, CIN II, CIN III, CIS, and
- 3 cancer.
- 1 8. A method of determining whether spectral data obtained from a region of a tissue
- 2 sample are affected by an artifact, said method comprising the steps of:
- obtaining a first set of spectral data corresponding to a region of a tissue sample
- 4 using light incident to said region at a first angle;
- obtaining a second set of spectral data corresponding to said region using light
- 6 incident to said region at a second angle; and
- determining whether said first set of data is affected by an artifact based at least in
- part on a subset of said first set of data and a subset of said second set of data.
- 1 9. The method of claim 8, wherein said first set of spectral data comprises
- 2 reflectance spectral data and said second set of spectral data comprises reflectance
- 3 spectral data.
- 1 10. The method of claim 8, further comprising obtaining a third set of spectral data,
- where said third set of spectral data comprises fluorescence spectral data.
- 1 11. The method of claim 8, wherein said determining step comprises computing a
- difference between R₁, a member of said first set of spectral data, and R₂, a member of
- said second set of spectral data, and comparing said difference to a constant, where R_1
- and R_2 correspond to at least approximately identical wavelengths.
- 1 12. The method of claim 11, wherein said difference is a percent difference.
- 1 13. The method of claim 8, wherein said determining step comprises computing N
- differences, $|R_1(X_i)-R_2(X_i)|$, optionally weighting each of said differences using at least

- one of $R_1(X_i)$ and $R_2(X_i)$, defining a maximum of a subset of said N optionally-weighted
- differences, and comparing said maximum to a first constant, where i = 1 to N, N is an
- integer, X_i is a wavelength between about 360nm and about 720nm, $R_1(X_i)$ is a member
- of said first set of data corresponding to said wavelength X_i, and R₂(X_i) is a member of
- said second set of data corresponding to said wavelength X_i.
- 1 14. The method of claim 13, wherein said determining step further comprises
- comparing $R_1(X_1)$ to a second constant, where $R_1(X_1)$ is a member of said first set of data
- 3 corresponding to a wavelength X_1 between about 409nm and about 429nm.
- 1 15. The method of claim 8, wherein said determining step comprises comparing
- $R_1(X_1)$ to a constant, where $R_1(X_1)$ is a member of said first set of data corresponding to a
- 3 wavelength X₁ between about 409nm and about 429nm.
- 1 16. The method of claim 8, wherein said determining step comprises comparing the
- quotient $R_1(X_1)/R_1(X_2)$ to a constant, where $R_1(X_1)$ is a member of said first set of data
- corresponding to a wavelength X_1 between about 360nm and about 720nm, and $R_1(X_2)$ is
- a member of said first set of data corresponding to a wavelength X₂ between about
- 5 360nm and about 720nm.
- 1 17. The method of claim 16 wherein X_1 is a wavelength between about 489nm and
- 509nm and X_2 is a wavelength between about 533nm and about 553nm.
- 1 18. The method of claim 13, wherein said determining step further comprises
- comparing the quotient $\{(R_1(X_1)/R_2(X_1))/(R_1(X_2)/R_2(X_2))\}$ to a second constant, where
- X_1 is a wavelength between about 360nm and about 720nm, X_2 is a wavelength between
- about 360nm and about 720nm, $R_1(X_1)$ is a member of said first set of data corresponding
- to said wavelength X_1 , $R_2(X_1)$ is a member of said second set of data corresponding to

- said wavelength X_1 , $R_1(X_2)$ is a member of said first set of data corresponding to said
- 7 wavelength X_2 , $R_2(X_2)$ is a member of said second set of data corresponding to said
- 8 wavelength X₂.
- 1 19. The method of claim 18 wherein X_1 is a wavelength between about 566nm and
- about 586nm, and X_2 is a wavelength between about 589nm and about 609nm.
- 1 20. The method of claim 19, wherein said determining step further comprises
- comparing $R_1(X_3)$ to a third constant, where $R_1(X_3)$ is a member of said first set of data
- 3 corresponding to a wavelength X₃ between about 689 and about 709nm.
- 1 21. The method of claim 13, wherein said determining step further comprises
- 2 comparing a value Q to a second constant, where Q is an approximate slope of a plot of
- $\{R_1(X_i)/R_2(X_i)\}\$ with respect to wavelength, over a subset of a wavelength range of about
- 4 360nm to about 720nm.
- 1 22. The method of claim 15, wherein said determining step further comprises
- 2 comparing a value Q to a second constant, where said value Q is an approximate slope of
- a plot of $\{R_1(X_i)/R_2(X_i)\}$ with respect to wavelength, over a subset of a wavelength range
- 4 of about 576nm to about 599nm.
- 1 23. The method of claim 13, wherein said determining step further comprises
- comparing $R_1(X_1)$ to a second constant and comparing $R_1(X_1)$ to $R_2(X_1)$, where $R_1(X_1)$ is
- a member of said first set of data corresponding to a wavelength X₁ between about
- 4 360nm and about 720nm, and $R_2(X_1)$ is a member of said second set of data
- 5 corresponding to said wavelength X_1 .
- 1 24. The method of claim 13, wherein said determining step further comprises
- comparing $R_1(X_1)$ to a second constant and comparing $R_1(X_1)$ to $R_2(X_1)$, where $R_1(X_1)$ is

- a member of said first set of data corresponding to a wavelength X₁ between about
- 4 489nm and about 509nm, and $R_2(X_1)$ is a member of said second set of data
- 5 corresponding to said wavelength X_1 .
- 1 25. The method of claim 18, wherein said determining step further comprises
- comparing $R_1(X_3)$ to a third constant, where $R_1(X_3)$ is a member of said first set of data
- 3 corresponding to a wavelength X₃ between about 360nm and about 720nm.
- 1 26. The method of claim 18, wherein said determining step further comprises
- comparing $R_1(X_3)$ to a third constant, where $R_1(X_3)$ is a member of said first set of data
- 3 corresponding to a wavelength X₃ between about 409nm and about 429nm.
- 1 27. The method of claim 8, wherein said determining step comprises comparing R₁ to
- 2 a first constant and comparing R₂ to a second constant, where R₁ is a member of said first
- set of data corresponding to a wavelength between about 489nm and about 509nm and R₂
- 4 is a member of said second set of data corresponding to a wavelength between about
- 5 489nm and about 509nm.
- 1 28. The method of claim 8, wherein said artifact comprises a lighting artifact.
- 1 29. The method of claim 28, wherein said lighting artifact comprises glare.
- 1 30. The method of claim 28, wherein said lighting artifact comprises shadow.
- 1 31. The method of claim 8, wherein said artifact comprises an obstruction.
- 1 32. The method of claim 31, wherein said obstruction comprises blood.
- 1 33. The method of claim 31, wherein said obstruction comprises a portion of at least
- 2 one of a group consisting of a speculum and a smoke tube.
- 1 34. The method of claim 31, wherein said obstruction comprises mucus.
- 1 35. The method of claim 8, wherein said tissue sample comprises cervical tissue.

- 1 36. The method of claim 8, wherein said tissue sample comprises epithelial cells.
- 1 37. The method of claim 8, wherein said tissue sample comprises at least one of a
- 2 group consisting of colorectal, gastroesophageal, urinary bladder, lung, and skin tissue.
- 1 38. A method of determining whether spectral data corresponding to a region of a
- tissue sample is affected by an artifact, said method comprising the steps of:
- obtaining a first set of reflectance spectral data corresponding to a region of a
- 4 tissue sample using light incident to said region at a first angle;
- obtaining a second set of reflectance spectral data corresponding to said region
- 6 using light incident to said region at a second angle;
- obtaining a set of fluorescence spectral data corresponding to said region; and
- determining whether any of said first set of reflectance spectral data, said second
- 9 set of reflectance spectral data and said set of fluorescence spectral data are affected by
- an artifact based at least in part on at least one of the following: a subset of said first set
- of reflectance spectral data, a subset of said second set of reflectance spectral data, and a
- subset of said set of fluorescence spectral data.
- 1 39. The method of claim 38, wherein said determining step comprises comparing F to
- a constant, where F is a member of said set of fluorescence spectral data corresponding to
- a wavelength between about 469nm and about 489nm.
- 1 40. A method of determining a spectral characteristic of an artifact, said method
- 2 comprising the steps of:
- at each of a first plurality of regions of tissue, obtaining a first set of
- 4 reflectance spectral data affected by a known artifact;

- 5 (b) at each of a second plurality of regions of tissue, obtaining a second set of
- 6 reflectance spectral data not affected by said known artifact; and
- 7 (c) determining a spectral characteristic of said known artifact based at least
- 8 in part on said first set of spectral data and said second set of spectral data.
- 1 41. The method of claim 40, wherein said determining step comprises locating a
- 2 wavelength at which there is a maximum difference between a mean of one or more
- members of said first set corresponding to said wavelength and a mean of one or more
- 4 members of said second set corresponding to said wavelength, relative to a variation
- 5 measure.
- 1 42. The method of claim 40, wherein said determining step comprises computing N
- differences, $|\mu_i(A_i(X_i)) \mu_i(B_k(X_i))|$, and defining a maximum of a subset of said N
- differences, where i = 1 to N, N is an integer, X_i is a wavelength between about 360nm
- and about 720nm, j = 1 to M1, M1 is an integer, $A_i(X_i)$ represents one of M1 members of
- said first set of reflectance spectral data corresponding to said wavelength X_i , k = 1 to
- 6 M2, M2 is an integer, $B_k(X_i)$ represents one of M2 members of said second set of
- reflectance spectral data corresponding to said wavelength X_i , $\mu_i(A_i(X_i))$ is a mean of said
- 8 M1 members of said first set of data corresponding to said wavelength X_i , and $\mu_i(B_k(X_i))$
- 9 is a mean of said M2 members of said second set of data corresponding to said
- 10 wavelength X_i.
- 1 43. The method of claim 40, wherein said determining step comprises computing N
- quotients, $[|\mu_i(A_j(X_i))-\mu_i(B_k(X_i))|/\{\sigma_i^2(A_j(X_i))+\sigma_i^2(B_k(X_i))\}^{0.5}\}$, and defining a maximum
- of a subset of said N quotients, where i = 1 to N, N is an integer, X_i is a wavelength
- between about 360nm and about 720nm, j = 1 to M1, M1 is an integer, $A_i(X_i)$ represents

- one of M1 members of said first set of reflectance spectral data corresponding to said
- wavelength X_i , k = 1 to M2, M2 is an integer, $B_k(X_i)$ represents one of M2 members of
- said second set of reflectance spectral data corresponding to said wavelength X_i,
- 8 $\mu_i(A_j(X_i))$ is a mean of said M1 members of said first set of data corresponding to said
- wavelength X_i , $\mu_i(B_k(X_i))$ is a mean of said M2 members of said second set of data
- 10 corresponding to said wavelength X_i , $\sigma_i(A_i(X_i))$ represents a standard deviation of said
- M1 members of said first set of data corresponding to said wavelength X_i , and $\sigma_i(B_k(X_i))$
- represents a standard deviation of said M2 members of said second set of data
- corresponding to said wavelength X_i.
- 1 44. The method of claim 40, wherein said determining step comprises computing N
- 2 quotients, $[|\mu_i(A_i(X1_i)/A_i(X2_i))-\mu_i(B_k(X1_i)/B_k(X2_i))| / {\sigma_i(A_i(X1_i)/A_i(X2_i))+$
- $\sigma_i^2(B_k(X1_i)/B_k(X2_i))\}^{0.5}$], and defining a maximum of a subset of said N quotients, where
- i = 1 to N, N is an integer, $X1_i$ is a wavelength between about 360nm and about 720nm,
- 5 $X2_i$ is a wavelength between about 360nm and about 720nm, j = 1 to M1, M1 is an
- 6 integer, A_j(X1_i) represents one of M1 members of said first set of reflectance spectral
- data corresponding to said wavelength X1_i, A_j(X2_i) represents one of M1 members of
- said first set of reflectance spectral data corresponding to said wavelength $X2_i$, k = 1 to
- 9 M2, M2 is an integer, B_k(X1_i) represents one of M2 members of said second set of
- reflectance spectral data corresponding to said wavelength X1_i, B_k(X2_i) represents one of
- 11 M2 members of said second set of reflectance spectral data corresponding to said
- wavelength X_{2i} , $\mu_i(A_j(X_{1i})/A_j(X_{2i}))$ is a mean of M1 quotients $A_j(X_{1i})/A_j(X_{2i})$ for j = 1
- to M1, $\mu_i(B_k(X1_i)/B_k(X2_i))$ is a mean of M2 quotients $B_k(X1_i)/B_k(X2_i)$ for k = 1 to M2,
- $\sigma_i(A_j(X1_i)/A_j(X2_i))$ represents a standard deviation of said M1 quotients $A_j(X1_i)/A_j(X2_i)$,

- and $\sigma_i(B_k(X1_i)/B_k(X2_i))$ represents a standard deviation of said M2 quotients
- 16 $B_k(X1_i)/B_k(X2_i)$.
- 1 45. A method of determining a characteristic of a region of a tissue sample, said
- 2 method comprising the steps of:
- 3 (a) obtaining a first set of reflectance spectral data corresponding to a region
- 4 of a tissue sample using light incident to said region at a first angle;
- 5 (b) obtaining a second set of reflectance spectral data corresponding to said
- 6 region using light incident to said region at a second angle;
- 7 (c) determining whether at least one of said first set of reflectance data and
- said second set of reflectance data is affected by an artifact based at least in part on a
- 9 subset of said first set of reflectance data and a subset of said second set of reflectance
- 10 data;
- 11 (d) rejecting at least one member of at least one of said first set of reflectance
- data and said second set of reflectance data determined in step (c) to be affected by said
- 13 artifact; and
- (e) determining a characteristic of said region of said tissue sample based at
- least in part on at least one member of at least one of said first set of reflectance data and
- said second set of reflectance data not rejected in step (d).
- 1 46. The method of claim 45, further comprising obtaining a set of fluorescence
- 2 spectral data corresponding to said region, and wherein step (e) comprises determining
- said condition of said region of said tissue sample based at least in part on
- at least one member of at least one of said first set of reflectance data and said
- 5 second set of reflectance data

and at least one member of said set of fluorescence spectral data.